National Research Council Canada | Conseil national de recherches Canada

NRC·CNRC

National Research Council Canada

2013-14

Report on Plans and Priorities

The Honourable Christian Paradis
Minister of Industry and Minister of State (Agriculture)

Table of Contents

MINISTER OF INDUSTRY'S MESSAGE	1
MINISTER OF STATE'S MESSAGE	2
PRESIDENT'S MESSAGE	4
SECTION I: ORGANIZATIONAL OVERVIEW	**5**
RAISON D'ÊTRE	5
RESPONSIBILITIES	5
STRATEGIC OUTCOMES AND PROGRAM ALIGNMENT ARCHITECTURE (PAA)	6
ORGANIZATIONAL PRIORITIES	7
RISK ANALYSIS	10
PLANNING SUMMARY	11
EXPENDITURE PROFILE	13
ESTIMATES BY VOTE	14
SECTION II: ANALYSIS OF PROGRAMS BY STRATEGIC OUTCOMES	**15**
STRATEGIC OUTCOME 1	15
PROGRAM 1.1: MANUFACTURING TECHNOLOGIES	15
PLANNING HIGHLIGHTS	16
PROGRAM 1.2: INFORMATION AND COMMUNICATIONS TECHNOLOGIES (ICT) AND EMERGING TECHNOLOGIES	18
PLANNING HIGHLIGHTS	19
PROGRAM 1.3: INDUSTRIAL RESEARCH ASSISTANCE	20
PLANNING HIGHLIGHTS	21
PROGRAM 1.4: HEALTH AND LIFE SCIENCE TECHNOLOGIES	22
PLANNING HIGHLIGHTS	23
PROGRAM 1.5: ENERGY AND ENVIRONMENTAL TECHNOLOGIES	24
PLANNING HIGHLIGHTS	25
STRATEGIC OUTCOME 2	26
PROGRAM 2.1: NATIONAL SCIENCE AND TECHNOLOGY INFRASTRUCTURE	26
PLANNING HIGHLIGHTS	27
PROGRAM 2.2: SCIENTIFIC, TECHNICAL AND MEDICAL INFORMATION	28
PLANNING HIGHLIGHTS	28
INTERNAL SERVICES	29
PLANNING HIGHLIGHTS	29
SECTION III: SUPPLEMENTARY INFORMATION	**33**
FINANCIAL HIGHLIGHTS	33
FUTURE-ORIENTED FINANCIAL STATEMENTS	33
LIST OF SUPPLEMENTARY INFORMATION TABLES	33
TAX EXPENDITURES AND EVALUATIONS REPORT	34

SECTION IV: OTHER ITEMS OF INTEREST 35

ORGANIZATIONAL CONTACT INFORMATION 35

ENDNOTES 35

Minister of Industry's Message

In response to the continuing challenges facing the global economy, our government is determined to keep Canada strong and prosperous by creating the right conditions for businesses to invest in innovation, create jobs and grow our economy.

As Minister of Industry, I am pleased that the Industry Portfolio continues to play a key role in promoting innovation, improving Canada's marketplace policies, and efficiently managing programs and services. In doing so, we are advancing Canada's international position by supporting business growth, research and development, and targeted investment.

In refreshing the science and technology strategy and its priorities, we will strengthen federal support for business innovation and continue to build Canada's knowledge-based economy.

In 2013–14, the National Research Council of Canada (NRC) will continue its shift toward delivering support and services driven by market and industry demand. This new focus will help Canadian industry build its research and development capacity to advance Canada's innovation performance. The Government of Canada has also made additional investments in one of the NRC's most successful initiatives, the Industrial Research Assistance Program, doubling its budget to $220 million per year. This will enhance program and service delivery for Canadian small and medium-sized enterprises.

In fulfilling its mandate, the Industry Portfolio will prudently manage its financial and human resources and will play its part in the government's efforts to return to fiscal balance.

This year's Report on Plans and Priorities for the National Research Council articulates our approach to modernizing the Canadian marketplace, boosting innovation, and helping drive the competitiveness of Canadian businesses and communities. On behalf of the Department and Portfolio, I look forward to working with my Cabinet and parliamentary colleagues, as well as with the private sector and other levels of government, to accomplish these objectives.

Christian Paradis
Minister of Industry and Minister of State (Agriculture)

Minister of State's Message

As the Minister of State for Science and Technology, I am pleased to introduce the 2013–14 Report on Plans and Priorities for National Research Council Canada (NRC).

The report comes at a time when we have good reason to reflect on our many accomplishments and Canada's solid global reputation.

Late last year, the Council of Canadian Academies released its second report on the state of science and technology (S&T) in Canada. The Council found Canadian S&T to be healthy and growing and recognized for its excellence around the world.

The Secretary-General of the Organisation for Economic Co-operation and Development has praised Canada for the way it weathered the economic storms of the past several years. Our fiscal policy and our financial system are in good shape. As is the Canadian innovation system.

The government supports an advanced economy and the creation of high-quality jobs through investments in education and training, basic and applied research, and the translation of public research knowledge to the private sector. We are focused on the conditions necessary for a high performing innovation system: supportive marketplace frameworks, engaged citizens, highly skilled people and sound infrastructure.

Since 2006, we have invested $8 billion in new funding for science, technology and the growth of innovative firms. As we review and refresh our S&T strategy, we will continue to define the way governments, business people and the research community partner together to drive economic activity through science.

In response to the 2011 report on the impact of federal support for research and development (R&D), *Innovation Canada: A Call to Action*, work continued on transitioning the NRC into a research and technology organization (RTO) dedicated to supporting business R&D. Through industry-driven priorities in 2013–14, a refocused NRC will be in an optimal position to fill this void in Canada's innovation system. By helping to stimulate greater private sector investment in R&D, the NRC will directly assist Canadian companies in their quest to grow, remain competitive and employ highly skilled workers—factors that are critical to our country's growth and prosperity.

At a time when innovation is increasingly dependent on collaboration, Canada is taking a leadership role by delivering programs that bring the private and public sectors together, creating a supportive climate for start-ups, and attracting and retaining world-class

expertise. In 2013–14, I will continue to work with our academic partners, the private sector and Canadians to achieve the priorities laid out in this report.

Gary Goodyear
Minister of State (Science and Technology) (Federal Economic Development Agency for Southern Ontario)

President's Message

Mr. John McDougall, President

I am pleased to submit for tabling in Parliament, the 2013-14 Report on Plans and Priorities for the National Research Council of Canada. This past year has been one of tremendous change at NRC, as the organization has taken great strides to refocus itself on business and market-driven priorities and needs. The renewed NRC will help Canadian businesses develop innovative products and services, through the provisioning of effective industry-driven solutions to its clients.

For 2013-14, NRC will maintain its commitment to keeping Canadian industry at the forefront of its planning and service delivery. This will be represented through a fresh new positioning of the organization as a vital national research and technology organization. During the coming year, NRC will continue to roll out new industry-driven R&D programs and services in technology-intensive areas of national priority. The organization's business friendly approach will also provide international reach for Canadian firms by investing in key international alliances (such as EUREKA) and by facilitating access to global value chains. The needs of innovative Canadian small and medium-sized enterprises (SMEs) will be met through the provision of advisory services, networking and linking opportunities and funding support, delivered through the Industrial Research Assistance Program (IRAP). These activities combined will put the organization in an improved position to help boost productivity and innovation levels of Canadian SMEs and other key economic drivers.

NRC's steadfast application of its unique expertise, scientific facilities and know-how to the problems and challenges facing industry will result in higher-quality jobs, increased sales from commercialized technologies and increased business investment in R&D in Canada. These will all contribute to the robust economy and outstanding quality of life that Canadians have come to enjoy.

Section I: Organizational Overview

Raison d'être

The National Research Council Canada (NRC) bridges the innovation gap between early stage research and development (R&D) and commercialization, focusing on socio-economic benefits for Canada and increasing national performance in business-led R&D and innovation. A federal leader in technology development, NRC supports Canadian industry to enhance their innovation capabilities and capacity and become more productive in the development and deployment of innovative products, processes and services for markets of national priority and importance. With a presence in every province, NRC combines its strong national foundation with international linkages to help Canada grow in productivity and remain globally competitive. NRC works in collaboration with industry, governments and academia to maximize Canada's overall R&D investment.

Responsibilities

NRC is a departmental corporation of the Government of Canada, reporting to Parliament through the Minister of Industry. NRC works in partnership with members of the Industry Portfolio to leverage complementary resources to promote the innovation of firms, to exploit synergies in key areas of S&T, to promote the growth of small and medium-sized firms (SMEs) and to contribute to Canadian economic growth. NRC's Council provides independent strategic direction and advice to the NRC President and reviews organizational performance. The President provides leadership and strategic management and is responsible for the achievement of NRC's long-range goals and plans within the guidance of the NRC Council. Each of NRC's seven Vice Presidents is responsible for a number of areas composed of research programs, initiatives, centres and/or a corporate branch. Vice Presidents and NRC managers are responsible for executing plans and priorities to ensure successful achievement of objectives.

NRC MANDATE

Under the [1] *National Research Council Act*, NRC is responsible for:

- Undertaking, assisting or promoting scientific and industrial research in fields of importance to Canada;
- Providing vital scientific and technological services to the research and industrial communities;
- Investigating standards and methods of measurement;
- Working on the standardization and certification of scientific and technical apparatus, instruments and materials used or usable by Canadian industry;
- Operating and administering any astronomical observatories established or maintained by the Government of Canada;
- Establishing, operating and maintaining a national science library; and
- Publishing and selling or otherwise distributing such scientific and technical information as the Council deems necessary.

In 2013-14, NRC will continue its efforts to refocus into a unified, industry-driven organization to more effectively address the Government of Canada's innovation priorities

that will drive productivity and economic growth in Canada. To address these innovation priorities, NRC will focus on aligning its business activities and processes with market demand and industry need, opening up international markets for Canadian firms and making strategic investments where they will deliver the greatest impacts. NRC will also continue to streamline its corporate services so that these too align with private sector best practices, in an effort to realize greater operating efficiencies.

NRC VISION

To be the most effective research and technology organization in the world, stimulating sustainable domestic prosperity.

NRC MISSION

Working with clients and partners, we provide innovation support, strategic research, and scientific and technical services to develop and deploy solutions to meet Canada's current and future industrial and societal needs.

NRC's drive to deliver industry solutions and focus on client needs will make it a more attractive and valuable partner to industry and will contribute to building a more globally competitive and prosperous Canada. NRC will be committed to generating the following impacts for its clients:

- Increased business enterprise expenditures on R&D (BERD);
- Enhanced productivity;
- Sales of technologies; and
- Creation of high value jobs.

Strategic Outcomes and Program Alignment Architecture (PAA)

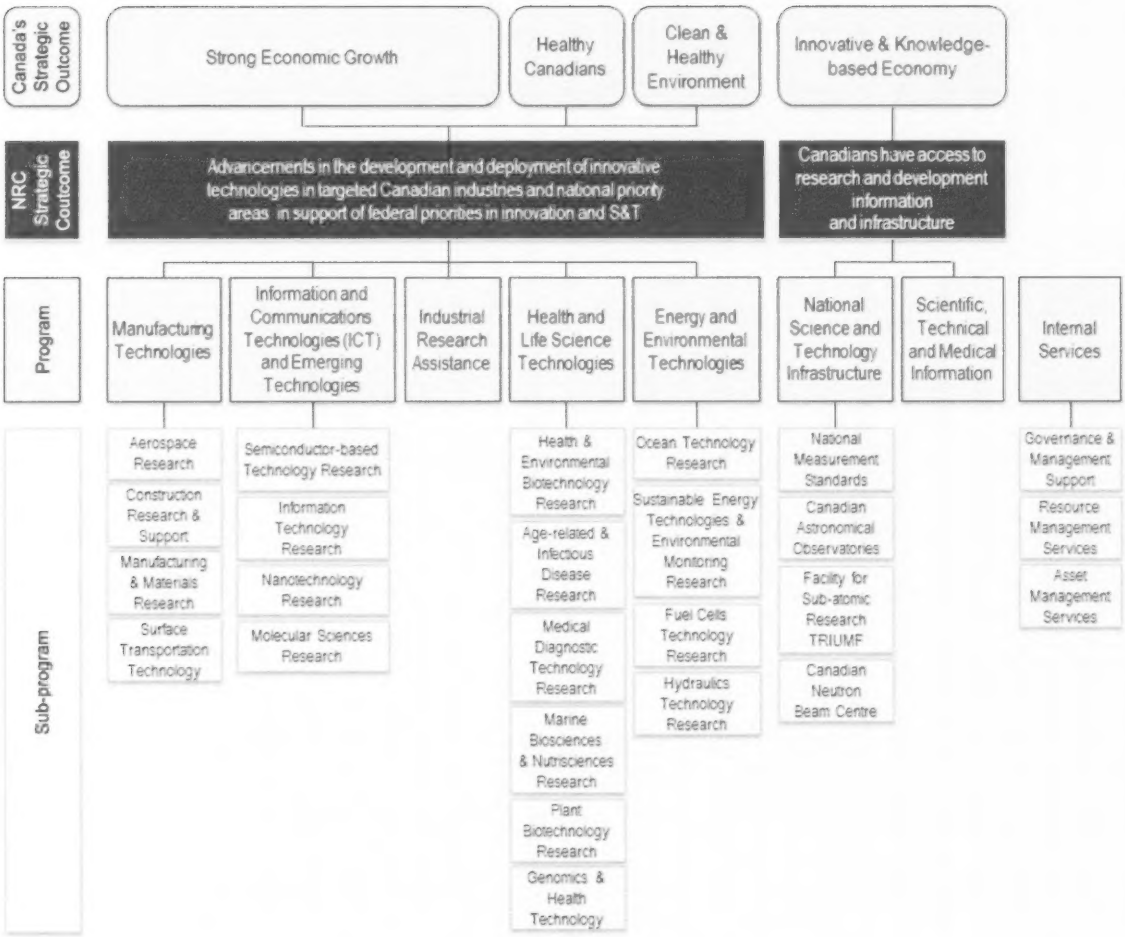
To fulfill its mandate, NRC's programs are aligned to achieve two Strategic Outcomes (SOs):

SO1. Advancements in innovative technologies and increased innovation capacity in targeted Canadian industries and national priority areas in support of federal priorities in innovation and science and technology.

SO2. Canadians have access to research and development information and infrastructure.

NRC's programs directly support these strategic outcomes. NRC's current PAA, shown below, illustrates how activities are organized to achieve these desired results.

NRC's current PAA is aligned with the [2] Government of Canada's Strategic Outcomes (SOs) and federal priorities. As NRC's new strategy is implemented, the NRC PAA will be reviewed and amended as necessary, to ensure continued alignment and contribution towards Canada's Strategic Outcomes.


Canada's Strategic Outcome
Strong Economic Growth
Healthy Canadians
Clean & Healthy Environment
Innovative & Knowledge-based Economy
NRC Strategic Coutcome
Advancements in the development and deployment of innovative technologies in targeted Canadian industries and national priority areas in support of federal priorities in innovation and S&T
Canadians have access to research and development information and infrastructure
Program
Manufacturing Technologies
Information and Communications Technologies (ICT) and Emerging Technologies
Industrial Research Assistance
Health and Life Science Technologies
Energy and Environmental Technologies
National Science and Technology Infrastructure
Scientific, Technical and Medical Information
Internal Services
Sub-program
Aerospace Research
Construction Research & Support
Manufacturing & Materials Research
Surface Transportation Technology
Semiconductor-based Technology Research
Information Technology Research
Nanotechnology Research
Molecular Sciences Research
Health & Environmental Biotechnology Research
Age-related & Infectious Disease Research
Medical Diagnostic Technology Research
Marine Biosciences & Nutrisciences Research
Plant Biotechnology Research
Genomics & Health Technology
Ocean Technology Research
Sustainable Energy Technologies & Environmental Monitoring Research
Fuel Cells Technology Research
Hydraulics Technology Research
National Measurement Standards
Canadian Astronomical Observatories
Facility for Sub-atomic Research TRIUMF
Canadian Neutron Beam Centre
Governance & Management Support
Resource Management Services
Asset Management Services

Organizational Priorities

NRC's priorities will continue to support the overarching goals of [3] Canada's S&T Strategy, *Mobilizing Science and Technology to Canada's Advantage*, creating an environment of innovation that drives Canadian businesses to succeed in globalized markets by becoming a top global innovation producer. Providing successful support for the Government of Canada's S&T Strategy requires coordinated and collaborative efforts from all levels of government, private industry, academia and not-for-profits to overcome gaps and eliminate barriers in the innovation system. NRC plays a crucial role in this system by developing and deploying technology and assisting Canadian companies in the development and deployment of technology in, and supporting the priority areas of the federal S&T Strategy: Information and communications technologies, environmental science and technologies, natural resources and energy, and health and related life sciences and technologies. In 2013-14, NRC's plans and priorities will continue to be industry-driven, focusing on where it can make the most difference to build upon Canadian successes and capacities in these areas.

Priority 1	Type[1]	Strategic Outcome
Cultivate business innovation to increase the productivity of Canada's industrial sectors in support of economic growth and development in Canada, including efforts to open up international markets for Canadian firms.	Ongoing	SO1: Advancements in innovative technologies and increased innovation capacity in targeted Canadian industries and national priority areas in support of federal priorities in innovation and science and technology.

Description

Why is this a priority?

- Canada's global competitiveness is currently lagging relative to established and emerging competitor nations, creating a challenge for long-term, sustainable productivity and prosperity. The 2012 World Economic Forum [4] analysis of global competitiveness ranks Canada 14th out of 144 countries, down from 12th in 2012 and 10th in 2010.
- The [5] 2012 Global Innovation Index shows that Canada is the only country to drop out of the top 10, and now stands at 12th place.
- Business innovation is one of the most important drivers of increased productivity, sustainability, and national competitiveness. The Review of Federal Support to Research and Development (2011): *Innovation Canada: A call to action*, re-enforces the need for innovation to stimulate economic growth and ensure Canada's industrial competitiveness.

Plans for meeting the priority

- NRC will focus its activities on performing research, technology development and technology demonstration, along with adopting/adapting technology for industry in sectors of importance to Canada's economy and the federal S&T Strategy, including: aerospace, automotive, construction, marine technologies, energy and environment. NRC will also work in collaboration with, and provide technical services to, high impact Canadian-based companies in the areas of vaccines, biopharmaceuticals, medical devices and natural health products. Business planning, performance metrics and regular reviews will be used to track progress and success of its activities.
- NRC will use collaborative approaches to form strategic partnerships and engage key stakeholders and facilitate networks between and among industry and innovation players like universities and other government departments, to accelerate the commercialization of products and processes in key technology areas such as photonics. This will ensure that the resources will be leveraged with support from other key players in Canada's innovation system and that research activities will deliver real and measurable impacts for Canada.
- Through its international framework, NRC will grow Canadian industrial competitiveness by investing in key international alliances (such as EUREKA) and by facilitating access to global value chains. NRC will support Canadian industry in accessing global markets by continuing to advance emerging technologies of increasing prominence nationally and globally, such as green technologies for the manufacturing sector, smart buildings and nanotechnology applications, as well as advancing the development of standards aligned with international norms.
- The NRC Industrial Research Assistance Program (NRC-IRAP) will support the needs of innovative Canadian small and medium-sized enterprises (SMEs) by providing advisory services, networking and linking opportunities and funding support for cost-shared merit-based projects in an effort to boost SME R&D and innovation activities which will, in turn, increase their productivity, sustainability and competitiveness.

Priority 2	Type	Strategic Outcome
Enhance the generation and commercialization of knowledge in Canada by providing integrated scientific support and infrastructure.	Ongoing	SO2: Canadians have access to research and development information and infrastructure.

[1] Type is defined as: **Previously committed to** – committed to in the first or second fiscal year before the subject year of the report; **Ongoing** – committed to at least three fiscal years before the subject year of the report; and **New** – newly committed to in the reporting year of the Reports on Plans and Priorities or the Departmental Performance Report.

Description
Why is this a priority? • To enhance Canada's capacity to generate new knowledge and translate it into real economic value, providing access to high quality scientific services and infrastructure is required. In collaboration with academic, industrial and government partners, R&D infrastructure must be managed efficiently to ensure they remain at the leading edge and accessible to all Canadians. **Plans for meeting the priority** • NRC will proactively work with Canadian industry to provide access to world class R&D infrastructure as needed and an array of facilities, programs and technology platforms designed to allow them to perform leading-edge research and deliver innovative solutions to the marketplace.

Priority 3	Type	Strategic Outcome
Strengthen NRC's business model to deliver on expected results.	Ongoing	SO1: Advancements in innovative technologies and increased innovation capacity in targeted Canadian industries and national priority areas in support of federal priorities in innovation and science and technology, and, SO2: Canadians have access to research and development information and infrastructure.
Description		
Why is this a priority? • Changes to NRC's business model will ensure that relevant management practices are in place to achieve goals that contribute to industry needs and federal S&T priorities. **Plans for meeting the priority** • Within the program-based management model designed by NRC to meet industry-identified needs and demands, all NRC research activities will be effectively managed to ensure they operate within approved programs that are multi-disciplinary, market-oriented and collaborative, built around a sound understanding of industry value chains, and with clear technology development paths. • NRC will enhance client relationships through a number of initiatives, including improved identification and analysis of target markets, new intellectual property options, managing to client satisfaction targets, effective use of the newly implemented Client Relationship Management system, as well as streamlined and more business-relevant internal processes.		

Priority 4	Type	Strategic Outcomes
Ensure effective and efficient resource management for a sustainable organization (including efforts in streamlining corporate services).	Ongoing	SO1: Advancements in innovative technologies and increased innovation capacity in targeted Canadian industries and national priority areas in support of federal priorities in innovation and science and technology, and, SO2: Canadians have access to research and development information and infrastructure.
Description		
Why is this a priority? • Resource management effectiveness is critical to ensuring Canadian research initiatives produce technologies with international market-demand while maintaining low delivery costs. • NRC must be a sustainable and responsive national research and technology organization in order to achieve its strategic outcomes. **Plans for meeting the priority** • NRC will focus on human resource initiatives that attract, develop and engage talent and build management capacity. • NRC will establish a procurement model which will be efficient in delivering on research requirements. • NRC will establish standards and an effective service delivery model for building management activities – one which will be consistent for all regions in which NRC operates. • NRC will standardize and reduce the complexity of its Information Technology (IT) environment, and additionally standardize its baseline security services across the organization. Security investments beyond the baseline will be supported by business cases which will include threat-risk assessments.		

Risk Analysis

As NRC continues its refocusing efforts in 2013-14 to better meet the needs of Canadian stakeholders and industry, the risks it faces relate in large part to ensuring that the organization has the design and management capacity in place to build and deliver programs for industry uptake. At the same time, it must effectively manage the associated changes and impacts – both internally with staff to maintain operations, and externally with partners and clients to sustain engagement.

Key internal and external factors affecting NRC's risks include:

- Internally, as part of the organization's refocusing efforts, new business and operating models are being developed, including restructuring of corporate services to allow for greater efficiencies, as well as implementation of new financial management, program management and client relationship management processes and systems.
- Externally, the Canadian Government has endorsed NRC's role to effect greater private sector innovation by doubling NRC-IRAP's budget to $220M per year, impacting its level of activity. The ongoing fragile global economy and declining Canadian global competitiveness are anticipated to have an impact on the performance of NRC clients, potentially affecting NRC's achievement of business targets.

To address these risks as defined in NRC's 2013-14 Corporate Risk Profile, areas of action for the organization will focus on:

1. **Building management capacity and expertise to design and mobilize an effective program-based management organization,** including optimizing NRC's recruitment process to ensure that the organization has the necessary business and technical expertise to design and deliver programs for impact. Internally, NRC will identify the gaps in management support, tools and information required by NRC managers to function effectively and cohesively to deliver programs. A communications and branding campaign will additionally raise awareness and visibility of NRC services available to Canadian industry, and is anticipated to also help future recruitment efforts.
2. **Effectively managing NRC's refocusing changes while sustaining operational efficiency.** Part of change management will include initiatives to maintain staff, client and partner engagement during NRC's refocusing efforts. Building on initiatives started in 2012-13, a series of staff engagement activities are planned for 2013-14, including a redesigned intranet to allow greater staff interaction, and new collaborative platforms and tools. New client relationship leader positions have been established to facilitate greater client and partner engagement and increase and strengthen relationships as NRC's programs progress. A redesigned key account management process and system will be implemented to complement NRC's newly-introduced client relationship management system.
3. **Enhancing operational effectiveness** through continued training and support for new processes and systems, defining scope and responsibilities (including better integrating common services) to support NRC's efforts for streamlining where possible. Work towards better integration of risk management, emergency management including security and occupational health and safety, and business continuity planning will help ensure more effective incident management (preparedness and response). Better tying of program management with investment planning will also support capital asset management for sustainability and reduce administrative burden.

Moving forward, NRC's corporate risks and associated progress against actions will be reviewed by NRC's Senior Executive Committee on a quarterly basis for updates and adjustments where needed.

Planning Summary

Financial Resources (Planned Spending – $ millions)

Total Budgetary Expenditures (Main Estimates) 2013-14	Planned Spending 2013-14	Planned Spending 2014-15	Planned Spending 2015-16
820.0	820.0	812.8	822.2

For an explanation of the annual variation in spending, please refer to the discussion of the spending trend in the Expenditure Profile subsection.

Human Resources (Full Time Equivalents – FTEs)

2013-14	2014-15	2015-16
3392	3469	3486

Planning Summary Table ($ millions)

Strategic Outcome	Program	Actual Spending 2010-11	Actual Spending 2011-12[2]	Forecast Spending 2012-13[3]	Planned Spending			Alignment to [6] Government of Canada Outcomes
					2013-14	2014-15	2015-16	
SO1: Advancements in innovative technologies and increased innovation capacity in targeted Canadian industries and national priority areas in support of federal priorities in innovation and	Manufacturing Technologies	128.6	111.8	118.8	112.1	125.8[4]	137.9[5]	Strong Economic Growth
	Information and Communications Technologies and Emerging Technologies	77.2	69.1	54.6	50.3	54.4	58.1	Strong Economic Growth
	Industrial Research Assistance	286.2	146.3	255.6	279.9[6]	240.7[7]	240.7	Strong Economic Growth
	Health and Life Science	115.1	102.9	82.7	73.3	69.7	74.2	Healthy Canadians

[2] Reflects the sunset of Canada's Economic Action Plan.
[3] Forecast spending includes Budget 2012 items.
[4] The $13.7M increase in planned spending between 2013-14 and 2014-15 is mostly attributable to increased statutory revenues ($13.9M).
[5] The $12.1M increase in planned spending between 2014-15 and 2015-16 is mostly attributable to increased statutory revenues ($11.9M).
[6] The $24.3M increase in planned spending in 2013-14 is largely due to the incremental increase in funding from Budget 2012 and the re-profiling of the Digital Technology Adoption Pilot Program and Canadian HIV Technology Development Initiative.
[7] The $39.2M decrease in planned spending between 2013-14 and 2014-15 is due to the sunsetting of transfer payments for the Digital Technology Adoption Pilot Program.

science and technology	Technologies							
	Energy and Environmental Technologies	36.5	30.0	29.5	33.5	38.3	42.5	A Clean and Healthy Environment
Sub-total*		643.6	460.1	541.2	549.1	528.9	553.4	

* Sub-totals may not add due to rounding.

Planning Summary Table ($ millions)

Strategic Outcome	Program	Actual Spending 2010-11	Actual Spending 2011-12	Forecast Spending 2012-13[8]	Planned Spending			Alignment to [7] Government of Canada Outcomes
					2013-14	2014-15	2015-16	
SO2: Canadians have access to research and development information and infrastructure	National Science and Technology Infrastructure	98.6	96.4	98.1	94.3	98.2	75.3[9]	An Innovative and Knowledge-based Economy
	Scientific, Technical and Medical Information	33.6	18.1	18.0	14.7	14.7	14.7	An Innovative and Knowledge-based Economy
Sub-total*		132.2	114.5	116.1	109.0	112.9	90.0	

* Sub-totals may not add due to rounding.

Planning Summary Table for Internal Services ($ millions)

Program	Actual Spending 2010-11	Actual Spending 2011-12[10]	Forecast Spending 2012-13[11]	Planned Spending		
				2013-14	2014-15	2015-16
Internal Services	127.6	123.9	195.4	162.0[12]	171.0	178.9
Sub-total*	127.6	123.9	195.4	162.0	171.0	178.9

* Sub-totals may not add due to rounding.

[8] Forecast spending includes Budget 2012 items.

[9] The $22.9M decrease in planned spending between 2014-15 and 2015-16 is mostly due to the sunsetting of supplemental funding for TRIUMF ($25.7M).

[10] Reflects the sunset of Canada's Economic Action Plan.

[11] Internal services were consolidated in 2012-13 resulting in a significant increase in expenditures with accompanying decrease in expenditures previously attributed to R&D. This was done to facilitate efficiency and reduce overall expenditures for internal services.

[12] The $33.4M decrease in planned spending in 2013-14 is largely due to Planned Savings decrease ($10.3M), a decrease for Refocusing Budget 2012 ($10.0M) and a decrease in capital ($10.5M).

Planning Summary Total ($ millions)

Strategic Outcomes Programs and Internal Services	Actual Spending 2010-11	Actual Spending 2011-12	Forecast Spending 2012-13[13]	Planned Spending		
				2013-14	2014-15	2015-16
SO1: Advancements in innovative technologies and increased innovation capacity in targeted Canadian industries and national priority areas in support of federal priorities in innovation and science and technology	643.6	460.1	541.2	549.1	528.9	553.4
SO2: Canadians have access to research and development information and infrastructure	132.2	114.5	116.1	109.0	112.9	90.0
Internal Services	127.6	123.9	195.4	162.0	171.0	178.9
Total*	903.3	698.5	852.7	820.0	812.8	822.2

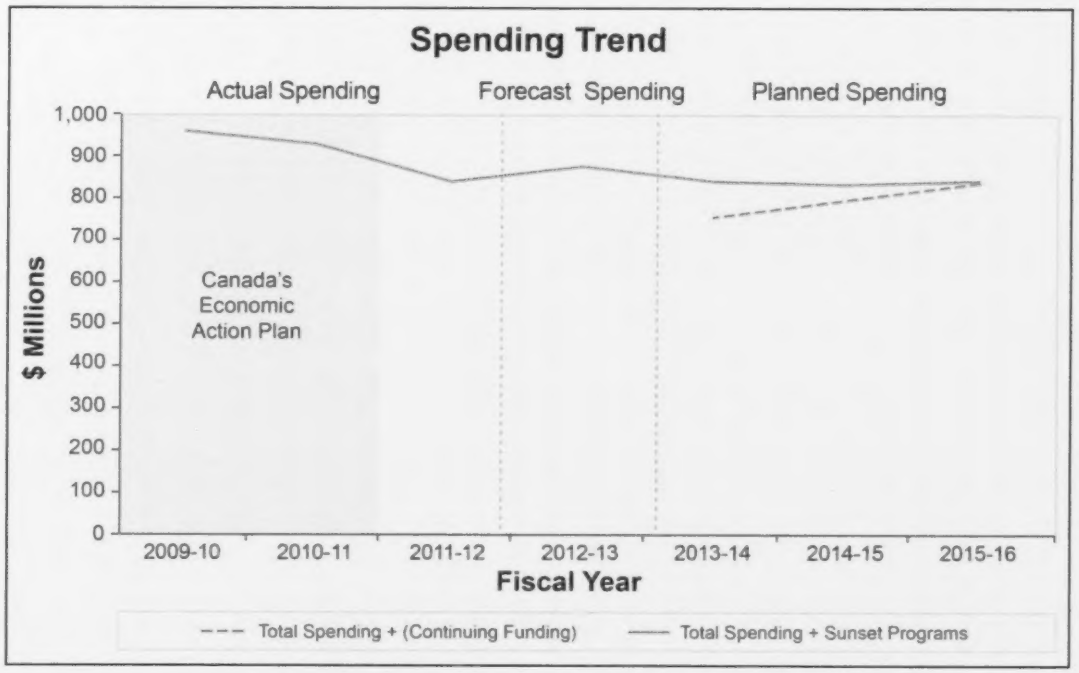
* Totals may not add due to rounding.

Expenditure Profile

The Forecast Spending for fiscal year 2012-13 is $852.7M. For the three previous fiscal years (fiscals 2009-10 to 2011-12) average spending was $885.1M which included spending for Canada's Economic Action Plan (CEAP) in 2009-10 and 2010-11. The amount spent in 2011-12 is directly related to the completion of the CEAP initiatives. The increase in Planned Spending for 2012-13 and onwards is mainly due to the increased funding for the Industrial Research Assistance Program as announced in Budget 2012.

[13] Internal services were consolidated in 2012-13 resulting in a significant increase in expenditures with accompanying decrease in expenditures previously attributed to R&D. This was done to facilitate efficiency and reduce overall expenditures for internal services.

Departmental Spending Trend



Estimates by Vote

For information on NRC organizational appropriations, please see the [8] 2013-14 Main Estimates publication.

Section II: Analysis of Programs by Strategic Outcomes

Strategic Outcome 1

Advancements in innovative technologies and increased innovation capacity in targeted Canadian industries and national priority areas in support of federal priorities in innovation and science and technology.

Program 1.1: Manufacturing Technologies

Program Description: *This program develops and advances technologies for enhancing the innovation capacity and growth of Canadian manufacturing industries. This is done through multi-disciplinary collaborative research and development services, in addition to specialized technical and advisory services for transferring or advancing technologies into deployed industrial solutions for the marketplace. This includes the development and testing of product and process innovations as well as the provision of coordinated access to multi-disciplinary research expertise and state-of-the art facilities to ensure that industries in Canada are at the leading edge of innovation.*

Financial Resources ($ millions)

Total Budgetary Expenditures (Main Estimates) 2013-14	Planned Spending 2013-14	Planned Spending 2014-15	Planned Spending 2015-16
112.1	112.1	125.8	137.9

Human Resources (FTEs)

2013-14	2014-15	2015-16
859	859	859

Program Expected Result	Performance Indicator	Target
Manufacturing industries in Canada have coordinated access to NRC's multi-disciplinary research expertise and state-of-the art facilities to ensure they are at the leading edge of innovation	Percentage of surveyed clients who report that NRC's manufacturing technologies research and facilities helped advance their innovation capacity	77% by March 2014

This program includes research, technology development and technology demonstration – crucial for Canadian companies to remain important players in a highly competitive global market – in the aerospace, automotive and construction sectors, all of which are large contributors to Canada's economy.

Canada has been particularly successful in aerospace through development of a large and globally recognized aerospace design and manufacturing sector, providing well-paying jobs and contributing to wealth creation and the balance of trade through export of high value-added products. The sector generates revenues of $21B annually, of which 73% is earned from exports, and in 2011 contributed [9] $6.8B to Canada's GDP, accounting for more than 4% of Canada's manufacturing GDP total.[14] Canada's rank of fifth largest aerospace industry in the world is the result of high levels of efficiency and innovation, supported by access to a pool of advanced technologies developed over the past four to five decades.

[14] Based on manufacturing GDP of $162.1B in 2011.

NRC has played a crucial role in supporting the aerospace industry in the development, demonstration and certification of new technologies through the application of nationwide capability in research and technology development and the provision of large scale and specialized facilities such as wind tunnels and the Gas Turbine Environmental Research Centre.

Canada's automotive sector is a successful, integrated industry including Original Equipment Manufacturers (OEMs), major Tier 1 suppliers and a well-developed supply chain. [10] This sector contributed $17B to Canada's GDP in 2011[15] and is Canada's largest manufacturing sector, currently accounting for close to 11% of manufacturing GDP and 24% of manufacturing trade. In 2011, Canada produced [11] 2.1 million light vehicles and purchased 1.6 million in addition, resulting in a significant net export volume to the rest of North America. NRC works with the Canadian automotive industry across the supply chain to develop, validate and deploy advanced technologies to manufacture lighter, more fuel efficient, environmentally-friendly and more economical-to-operate vehicles. It also assists Canadian automotive industry manufacturers and suppliers to reinforce their competitive position in the domestic and international markets by helping them enhance research and technology development, process and product innovation, and manufacturing process capabilities.

Construction represented [12] $76.5B of Canada's GDP in 2011. Increasingly competitive global construction markets and changing societal expectations are driving the demand for new cost-saving building systems and technologies, in areas such as indoor health and energy management, as well as the demand for increased public safety and cost efficiencies in civil infrastructure. NRC's leading-edge technical resources and services, including the Canadian Construction Materials Centre, provide industry with an effective and integrated innovative technology and business environment, encompassing the development and validation of cost-effective materials and technologies for buildings and infrastructure, smarter building regulations, and construction product assessment and market access services. Canadian citizens benefit economically from an industry that is strong, competitive and profitable, as well as socially, from a safe, sound and durable built environment.

Planning Highlights

For Canadian aerospace companies to succeed in the competitive global environment and continue to provide high quality employment and significant contribution to GDP, they must differentiate their products in the global market place, exploit emerging aerospace capabilities and have cost-effective access to the expertise and facilities required for product development. NRC's collaboration with Bell Helicopter and Bombardier Aerospace on automated fiber placement for building composite aircraft components is an excellent example of what can be achieved when these conditions are present. NRC will continue to focus its efforts on the provision of targeted-outcome multi-disciplinary research projects that leverage the use of state-of-the-art facilities and multi-partner agreements, bridging the gap between innovation and commercialization. NRC's

[15] This includes Motor Vehicle Manufacturing of $9.7B, Motor Vehicle Body and Trailer Manufacturing of $1.2B and Motor Vehicle Parts Manufacturing of $6.1B.

development and planned commercialization of several sensors for ice crystals (identified as a potential problem for aircraft since the 1950s) with major engine manufacturers is a current project that shows great promise for similar success thanks to this type of collaboration and cooperation. In 2014, and involving Canadian suppliers, NRC will flight-demonstrate one of these sensors for regulators and end-users.

In 2013-14, companies in Canada's aerospace sector will access NRC's R&D expertise and large scale, specialized facilities, reaping benefits including aircraft developmental and certification flight testing with small OEMs; a structural health monitoring system to achieve condition-based maintenance of aircraft; robotic friction stir welding (a cost-effective alternative to the use of fasteners in metallic aircraft assembly); engine weight reduction technologies to improve fuel consumption; and a precise non-contacting method to measure wing deflection under aerodynamic load in model-scale (already in use by Bombardier Aerospace to support performance assessment of their new aircraft programs, including the G7000/8000).

NRC will build on its recent achievement and major milestone in world aviation in having performed the first-ever flight of a civil jet powered by 100% biofuel. This flight was the culmination of efforts including industry partners and other government departments. NRC will continue to pursue projects of this type as it continues to drive toward a unified, industry-driven organization that addresses areas of national importance. In 2013-14, NRC will continue to work on aircraft biofuels, and begin to explore alternatives to conventional leaded aviation fuel for general aviation (piston engine) aircraft.

In 2013-14, NRC will strengthen the position of companies in the Canadian automotive industry by conducting and supporting technology development in light-weight materials, industrial biomaterials, alternative propulsion systems, and advanced manufacturing and design systems. When incorporated into vehicles, these technologies contribute to reduce overall vehicle weight and improve fuel efficiency as well as durability, leading to lower CO_2 emission, reduced wear and increased safety. NRC will also establish and deploy R&D activities within the CRIAL Consortium (Consortium de recherche et d'innovation en assemblage léger), specifically to promote the manufacturing and use of lightweight material structures for automotive applications. CRIAL will bring together diverse partners and SMEs and its activities will expand over three years.

Together with Canada's early adopters, NRC will develop a suite of breakthrough technologies that result in higher-performing buildings and civil engineering structures. NRC program outcomes of high performance materials and systems, such as ultra-high performing concrete (UHPC) for highway bridges, and advanced tools for the evaluation of building energy consumption and the assessment of conservation measures, address specific technology barriers enabling industry to meet asset-owner's needs. Commercialized through Canadian industries, these innovative technologies and materials will reduce construction and operation and maintenance costs, generate new jobs and stimulate economic growth, while maintaining the safety and security of Canadians. In 2013-14, outcomes delivered will include innovative building component designs leading to net-zero energy structures, simulation and validation of new technologies for building energy conservation and the monitoring of civil infrastructure, and tools for forecasting

building energy needs and the real-time performance of concrete bridges and related structures.

Program 1.2: Information and Communications Technologies (ICT) and Emerging Technologies

Program Description: *This program develops and advances technologies to enhance the innovation capacity and growth of Canadian industries in emerging technology sectors and in the Information and Communications Technologies (ICT) sector. This activity is undertaken through multi-disciplinary collaborative research and development and through specialized technical and advisory services. Technologies are developed into industrial solutions for the marketplace in the areas of energy, health and ICT, with particular emphasis on the Digital Economy. Activities include assembling and integrating product innovations at the prototype stage and providing access to research expertise and state-of-the art facilities to keep Canadian industry at the leading edge of innovation.*

Financial Resources ($ millions)

Total Budgetary Expenditures (Main Estimates) 2013-14	Planned Spending 2013-14	Planned Spending 2014-15	Planned Spending 2015-16
50.3	50.3	54.4	58.1

Human Resources (FTEs)

2013-14	2014-15	2015-16
236	236	236

Program Expected Result	Performance Indicators	Targets
Advancements in innovative technology solutions in emerging and ICT sectors	Revenue from service contracts and successful Intellectual Property (IP) transferred to emerging industry sectors	$1.5M by March 2014
	Percentage of clients reporting positively on the impact of NRC R&D on client growth	85% by March 2014

ICT is a leading driver of innovation, competitiveness and productivity. The ICT sector performs [13] 34% of Canada's private R&D activity. According to the Organisation for Economic Co-operation and Development (OECD), ICT investments accounted for over [14] 50% of the labour productivity growth in Canada over 2000-09. The more than 30,000 Canadian ICT firms employ over a half a million Canadians (about 3.2% of Canada's total employment) and generate [15] almost 5% of GDP. ICT and other emerging technologies play a transformative role, enabling entirely new applications to enter the market. NRC partners with the ICT industry through NRC-IRAP, research collaborations and technical services (for example, those provided by the NRC Canadian Photonics Fabrication Centre (NRC-CPFC)) to ensure that leading ICT is available to enhance the competitiveness of Canadian firms. NRC's broad range of ICT capabilities are also used as research tools and as enablers in other sectors. NRC is thus extremely well positioned to support industry leadership to drive Canadian industry's competitiveness in the digital economy.

Innovations in nanotechnology, also an enabler, will have an impact on a wide array of applications in the future, from materials sciences, alternative energy and biomedicine to ICT. Globally, as many as [16] 2 million new nanotechnology-related jobs are expected to be created by 2015, while sales are expected to reach [17] $48.9B in 2017. Canada shows particular strength in nanoelectronics, an area that may help Canada's ICT industry recover from the current downturn. The standards required to bring these new technologies to market and promote their safe and responsible use will also be important.
NRC works closely with industrial receptors to address emerging challenges for which technology solutions are inadequate or unknown, allowing industry to address rapidly changing and emerging markets. Its facilities support the growth of companies through their activities from research, through proof-of-concept, to technology demonstration, such as on-demand capability to design and test nanomaterials, devices and systems. NRC continues to work with industry to reduce risks related to technology development, including the creation of prototypes for commercial products for various sectors (e.g. advanced manufacturing, medical diagnostics and secure communications).

Planning Highlights

In 2013-14, NRC's ICT activities will support the digital economy to accelerate the growth of Canada's ICT and digital industries and to promote the adoption of ICT as an enabler for other sectors. NRC will conduct R&D in collaboration with industry in next-generation ICT components and software applications. Working with industry, NRC will lead multi-disciplinary research projects leveraging its ICT competencies: analytics and people-oriented learning systems; electronic and photonics materials, devices and systems; and communications applications. NRC will also continue to develop ICT capabilities with an emphasis on security applications and business intelligence tools for industry. Many of these technologies have multiple applications and effectively support the digital economy by engaging industry partners in significant collaborations that will lead to new products for global markets while contributing to national security priorities. For example, NRC data mining technologies will be applied to the health sector to track trends and identify pandemics.

NRC-CPFC, a collaboration among NRC, Carleton University and the Province of Ontario, supports the growth of photonics in emerging ICT markets by providing world-class engineering and manufacturing assistance, commercial grade foundry services and pilot-run production facilities. NRC-CPFC staff assist clients to develop and fabricate next-generation materials, devices, components and systems. Its services significantly lower the risk and barriers of entry to emerging ICT markets for SMEs in Canada. In 2013-14, NRC-CPFC will continue to provide more highly integrated device solutions. They will address key emerging markets including:

- next generation optical communication components to enable Canadian companies to scale up fibre optic communication network capacity, with emphasis on new technologies that can be deployed within five years to meet the anticipated data traffic growth; and
- energy efficient, less complex and higher bandwidth radio frequency (RF) power amplifiers for next generation wireless communication providers based on Gallium Nitride Electronics.

To work with the researchers and entrepreneurs that will lead the next wave of nanotechnology developments, in 2013-14 NRC will continue expanding its transformative programs, creating prototypes on which commercial products can be built. NRC will also continue to contribute to the large-scale international cooperative effort to develop new and improved measurement approaches, and standards and reference materials with nanoscale features. To assist in the responsible introduction of new technologies to national and international markets, NRC will work to develop measurement solutions that will underpin nanoscience applications, contribute to greater understanding of nanomaterials in the environment and living systems, and promote safe and responsible utilization of nanotechnologies.

Printable Electronics (PE) is an emerging field at the intersection of well-established Canadian industries: ICT and printing, and presents a transformative opportunity to add intelligence to printed products. NRC's PE program's long term goal is to position the packaging, commercial and security printing industries to be early adopters of emerging PE solutions making them global leaders. To achieve this objective, in 2013-14 NRC will work to establish and coordinate a Printable Electronics Consortium (PEC) to strengthen Canadian technical capacity in this field, and in 2015 operate a product development and demonstration centre (the Printable Electronics Prototyping Centre (PEPC)) to provide Canadian industry with the expertise and equipment they need to mitigate risk and succeed in manufacturing products.

Program 1.3: Industrial Research Assistance

Program Description: *The program supports small and medium-sized enterprise (SME) growth by stimulating innovation capacity and increasing the adoption and/or commercialization of technology-based products, services, or processes in Canada. Assistance is provided to increase opportunities for SME success through: 1) technical and business advice provided to SMEs by a cross-Canada network of field professional staff located in some 100 communities; 2) cost-shared merit-based non-repayable contributions to SMEs engaged in technological innovation of products, services and processes; 3) referrals to partner organizations and key contacts whose resources and international business networks benefit SMEs; and 4) expanding the knowledge-base and capacity of SMEs by increasing access to college and university graduates in SMEs done through NRC-IRAP's participation in the delivery of Human Resources and Skills Development Canada's Youth Employment Strategy (YES).*

Financial Resources ($ millions)

Total Budgetary Expenditures (Main Estimates) 2013-14	Planned Spending 2013-14	Planned Spending 2014-15	Planned Spending 2015-16
279.9	279.9	240.7	240.7

Human Resources (FTEs)

2013-14	2014-15	2015-16
344	421	438

Program Expected Result	Performance Indicators	Targets
SMEs in Canada have merit-based access to effective and efficient innovation support resulting in increased wealth	Average return in dollars to the Canadian economy (i.e., wealth creation in terms of increased sales and decreased cost) per dollar of Program cost	$7 by March 2014
	Number of jobs financially supported	2,500 by March 2014

Small and medium-sized enterprises (SMEs) make up 99.8% of all businesses in Canada, and employ about 6.9 million people (64% of all private sector employees). Just over [18] 5.1 million people (48%) work for small enterprises with fewer than 100 employees and more than 1.7 million (16%) work for medium-sized enterprises with 100-499 employees. SMEs face many challenges in commercializing their product offering and selling into global markets. A lack of funding poses risk to SMEs, as does a lack of appropriate and impartial business and technical advice.

NRC is committed to improving the long-term competitiveness of SMEs in Canada and helping to build a competitive advantage for Canada based on innovation by:

- Funding qualified firms for their innovative research and development-related projects through cost-shared merit-based non-repayable contributions. Potential projects are assessed on the business and management capabilities of the firm and the company's potential to achieve expected outcomes, the financial capabilities of the firm and plan to commercialize the developed technologies, and the technical aspects of the project and potential impact on the firm.
- Encouraging the hiring of recent graduates in science, engineering, technology, and business through the Youth Employment Program with funding opportunities targeted at innovative projects in research, development and the commercialization of technologies. SMEs receive a financial contribution geared towards supporting a portion of the salary costs of the post-secondary graduate. SMEs benefit from the knowledge of freshly minted minds while graduates gain valuable work experience that will open doors to the future.
- Delivering the Digital Technology Adoption Pilot Program (DTAPP) to increase the productivity growth of SMEs across all sectors through the adoption of digital technologies. NRC provides SMEs with access to expertise in digital technology adoption and also works with other government organizations to leverage the synergies of all available Digital Economy Strategy resources.

Planning Highlights

In 2013-14, NRC will expand its support to meet the innovation needs of SMEs. Industrial Technology Advisors (ITAs) located in over 100 communities across Canada will assist SMEs in developing and structuring their innovative projects and connect them with partner organizations that can provide further assistance in sources of financing, research and development and technology transfer. Cost-shared, non-repayable funding will be provided to SME clients to support their innovative projects based on merit. NRC will also continue to support job creation in Canadian SMEs through the Youth Employment Program.

DTAPP will continue to accelerate the adoption of digital technologies by Canadian SMEs. Cost-shared, non-repayable funding will be provided for digital technology adoption projects that will increase SME productivity. SME clients will also be supported through advisory services and linkages with colleges and other organizations which, through this program, are provided with funding to deliver critical consulting, training and technical services as well as access to facilities.

Program 1.4: Health and Life Science Technologies

Program Description: *In support of the Health and Related Life Sciences and Technologies priority of the federal S&T Strategy, this program develops and advances technologies and techniques that can enhance the innovation capacity and growth of Canadian industries in the health and life sciences sector. This is done through multi-disciplinary collaborative research and development services in addition to specialized technical and advisory services for transferring or advancing technologies into industrial solutions for the marketplace. This includes the development and testing of product and process innovations as well as the provision of coordinated access to multi-disciplinary research expertise and state-of-the art facilities to ensure that industries in Canada are at the leading edge of innovation.*

Financial Resources ($ millions)

Total Budgetary Expenditures (Main Estimates) 2013-14	Planned Spending 2013-14	Planned Spending 2014-15	Planned Spending 2015-16
73.3	73.3	69.7	74.2

Human Resources (FTEs)

2013-14	2014-15	2015-16
537	537	537

Program Expected Result	Performance Indicators	Targets
Canadian health and life science industries have greater access to effective and innovative technology solutions	Revenue from successful IP transferred to Health & Life Science industries	$2 million by March 2014
	Percentage of respondents from the health and life science industrial collaborators who respond positively on value of NRC innovative contributions	85% by March 2014

Health care cost, efficiency and effectiveness remain priorities for Canadians and their governments, which is driving the development of improved and lower cost therapies, diagnostics and treatments, and creating domestic and global market opportunities for Canadian-based companies. Companies are developing biologics – protein based therapeutics or vaccines (produced by biologic processes) that work with remarkable precision to support the body's natural immune system, offering new options for addressing diseases that were previously untreatable. Vaccines, which have saved more lives over the last 50 years than any other health intervention, have predominantly been developed for pediatric uses. Advances in technology are now enabling the development of vaccines for adults, which had world sales of $12.5B in 2010 (almost equal to pediatric sales) and are projected to increase at a compound annual growth rate of 10.3% to 2015. Hospitals are

demanding innovative medical technologies to increase patient safety, shorter recovery time, cost savings in the operating room and, consequently, improved patient care. The public, which is becoming ever more health conscious, is increasingly looking for safe, effective, proven natural health products.

By 2030, there will be an additional 2.3 billion people on earth and an additional one billion tonnes of cereals will be needed to meet world food demand, forecast to come from higher yields, and new crops varieties, and which translates into market potential for Canadian farmers. To address these issues and opportunities, Canadian industry is looking for partnerships to maximize resources, tap into specialized expertise and increase science, research and innovation capacities to develop timely and cost-effective solutions. NRC has world-class competencies in life sciences that will be leveraged to develop and bring to market integrated approaches to improve health care, reduce health care costs and increase agricultural productivity and food security.

Planning Highlights

NRC's innovative technologies and expertise in antigens and adjuvants, biomarker identification and manufacturing processes will address identified gaps in Canada's innovation system and accelerate the commercialization of vaccines. In 2013-14, NRC will concentrate its efforts on establishing new collaborations with Canadian-based companies, while continuing to strengthen its existing relationships to develop adult vaccines for influenza, pneumonia and diseases affecting high risk populations. Building on consultations held in 2011-12, NRC will assemble a network of stakeholders, including industry, vaccine manufacturers, government agencies and departments and researchers, to participate in strategic initiatives that will support Canadian industry in delivering technology-based solutions and products with market demand. NRC will also work to link Canadian vaccine manufacturers with NRC partners developing vaccine candidates.

Biologics, which can be personalized to the individual, have the potential to eliminate unnecessary treatments, reduce the incidence of adverse reactions, increase the efficacy of treatments and, ultimately, improve health outcomes and reduce hospitalization costs. Subsequent entry biosimilars (essentially generics of biologics) are expected to be available at 20-35% cost reductions within the next decade. Over the next five years, NRC will work with Canadian-based industry (SMEs and multinational enterprises) by providing antibody generation, molecular modeling, cell culture optimization, *in vitro* and *in vivo* activity assays and bioprocessing to help them bridge early stage innovation gaps. This will facilitate deployment of innovative products, processes and services and increase the market valuations of Canadian companies.

Faced with growing competition and increased regulatory scrutiny, Canada's natural health product companies can increase growth by investing in science-based innovation to develop new regulatory compliant globally competitive products. Over the next five years, NRC will provide custom science solutions for extraction, purification and identification of bioactives, analysis and characterization of functional ingredients, pre-clinical efficacy and safety testing, and assistance with product formulation. Development of standards and methods that support product integrity will reinforce Canada's international reputation for quality and safety.

Starting in 2013-14, NRC will work with Canadian-based companies to develop compact, cost-effective medical technologies which provide rapid, sensitive, accurate and globally competitive low-cost solutions. NRC will leverage its core multi-disciplinary competencies in biochips, functional nanomaterials, microdevices, *in vitro* diagnostics, medical photonics and medical simulation technologies to help these companies get leading-edge medical innovations on the market, creating value for Canada through their growth and providing cost effective solutions for the Canadian health care system.

NRC will partner with Agriculture and AgriFood Canada, the University of Saskatchewan and the province of Saskatchewan to accelerate the development of wheat varieties that will produce increased yields, cope with variable climates and require less fertilizer. The goal is to increase the profitability and sustainability of Canada's wheat production as well as the global competitiveness of Canadian farmers within the next 11 years. NRC will contribute its deep knowledge of gene sequences, gene expression patterns and gene interactions to develop novel genomic tools that will facilitate accelerated breeding of these new varieties.

Program 1.5: Energy and Environmental Technologies

Program Description: *In support of the Natural Resources and Energy priority and the Environmental Science and Technologies priority of the federal S&T Strategy, this program develops and advances technologies and techniques for enhancing the innovation capacity and growth of Canadian industries in the natural resources sector and to address Canadian environmental issues. This is done through multi-disciplinary collaborative research and development services in addition to specialized technical and advisory services for transferring or advancing technologies into industrial solutions for the marketplace. This includes the development and testing of product and process innovations as well as the provision of coordinated access to multi-disciplinary research expertise and state-of-the art facilities to ensure that industries in Canada are at the leading edge of innovation.*

Financial Resources ($ millions)

Total Budgetary Expenditures (Main Estimates) 2013-14	Planned Spending 2013-14	Planned Spending 2014-15	Planned Spending 2015-16
33.5	33.5	38.3	42.5

Human Resources (FTEs)

2013-14	2014-15	2015-16
224	224	224

Program Expected Result	Performance Indicator	Target
Collaborative contributions on improving sustainability of Canada's natural resources and protection of Canada's environment through innovation	Percentage of responding collaborators who respond positively on the value of NRC contributions to natural resource sustainability and environmental protection innovations	85% by March 2014

The energy sector is a very large contributor to Canada's economy, while ocean technologies have gained increasing importance in the last years. In both areas, research,

technology development and technology demonstration are crucial for Canadian companies to keep their competitive advantage in a demanding global market.

To accelerate the innovation process and maximize benefits to Canada, NRC works in the area of energy and environmental technologies in close collaboration with industrial participants across the value-chain, with a particular emphasis on strengthening Canadian suppliers of components to be competitive in world markets. This is primarily done, in consultation with other government departments, by carrying out multi-participant projects generated by industry-led consortia that allow suppliers to interact with users. In addition, Canadian suppliers are engaged to combine their R&D capacity with NRC's to deliver to international government-to-government research initiatives (such as with China, Germany and USA).

NRC contributes to the competitiveness of Canadian companies in the growing ocean technology market by utilizing its expertise and facilities and working with Canadian companies for the benefit of the marine industry and the Government of Canada, to deliver innovative technologies resulting in economic growth. NRC's proficiency in technology evaluation and development positions Canadian companies at the forefront of international markets, with technologies that reduce risks and costs of marine operations while assuring safe and responsible development of marine-based resources at home. Research activites focus on marine safety-improving lifesaving appliances, on the design of efficient marine vehicles for operation in rough waters and other applications for harsh climate and ice conditions, such as ice breaker assessments and sea ice drift forecast technologies.

Planning Highlights

NRC's R&D efforts will aim to reduce, within six years, the cost of energy storage technologies by 50% and demonstrate these cost savings at [19] Technology Readiness Level 7. This will allow these technologies to be deployed for a greater penetration of renewable energy supply into the grid and increase the grid's energy efficiency. NRC's activities related to sustainable bioenergy resources will have three main objectives: to reduce the full cost of ownership of bioenergy technology platforms, to reduce the cost of electricity in remote areas and to reduce the average capital payback period by maximizing revenue-generating outputs.

Through NRC's research, oil industry stakeholders have been made aware of problems in their evacuation craft, which will become more severe as they move into frontier regions where ice is present. In 2013-14, NRC will collaborate with a major external stakeholder to address two main thrusts: lifeboat air quality and operations in ice, waves and wind (anticipating large scale multi-year physical testing). The immediate outcome will be identification of operational envelopes and gaps in performance. This information will drive work in future years to improve the survivability of evacuated crew and provide the basis of regulatory change for the extreme arctic environment.

In 2013-14, NRC's algal carbon conversion initiative, in partnership with a large industrial emitter and SMEs working on technology development, will establish a pilot Algal Carbon Conversion facility using marine algae to convert carbon dioxide emissions, using waste heat and water, into biomass. The objective is to identify and deploy the most effective algae strains, improve photobioreactor, harvesting and de-watering technologies, and use

the biomass for the production of biofuel and other valuable products (including soil inoculants). NRC has a history of accomplishments in algal carbon conversion, and is poised to propel Canada to a world-leading position in managing carbon dioxide emissions by profitably converting them into value-added products. Proving this technology will help create markets for Canadian photobioreactor producers, and its implementation in the oil sands will help the environmental image of that sector.

Strategic Outcome 2

Canadians have access to research and development information and infrastructure

Program 2.1: National Science and Technology Infrastructure

Program Description: *This program manages national science facilities and infrastructure critical to research, development and innovation by Canadian scientific and technological communities. Facilities include the TRIUMF sub-atomic research facility and a suite of neutron-scattering spectrometers at Chalk River Laboratories. They also include astronomical observatories and the laboratory for national measurement standards, as mandated by the National Research Council Act.*

Financial Resources ($ millions)

Total Budgetary Expenditures (Main Estimates) 2013-14	Planned Spending 2013-14	Planned Spending 2014-15	Planned Spending 2015-16[16]
94.3	94.3	98.2	75.3

Human Resources (FTEs)

2013-14	2014-15	2015-16
257	257	257

Program Expected Result	Performance Indicators	Targets
Canada's national science and technology facilities are up-to-date and accessible to Canadians in accordance with federally legislated and assigned mandate and/or evolving national needs	Percentage of surveyed clients reporting positively on their perceived value of NRC R&D infrastructure used	85% by March 2014
	Number of Canadian users of major NRC science infrastructure	1,200 by March 2014

NRC manages and provides industry and other innovation system participants with access to the critical scientific services and infrastructure that support Canadian excellence in R&D. NRC works with academic, industrial and government partners to ensure that national S&T facilities are managed efficiently, remain at the leading edge and are accessible to Canadians in accordance with its assigned mandate and with evolving national needs. Canadian and international user communities access an array of national facilities and programs designed to allow them to conduct their scientific research. NRC provides stewardship over facility maintenance and access and develops supporting tools

[16] The $22.9M decrease in planned spending between 2014-15 and 2015-16 is mostly due to the sunsetting of supplemental funding for TRIUMF ($25.7M).

and instrumentation. NRC also develops the measurement standards that allow emerging technologies to be commercialized and companies to access the international market.

Planning Highlights

NRC measurement science and standards activities underpin industrial competitiveness, trade, and commerce. Accurate, reliable measurement is the scientific foundation upon which modern quality infrastructure is built. It provides the evidence basis for standardization, reliable testing and production methodologies, as well as internationally recognized certification and accreditation programs. In 2013-14, NRC will facilitate Canada's entry into global markets for new technologies by developing measurement standards for current and emerging areas such as the environment, nanotechnology and biotechnology.

In alignment with its mandate, NRC administers and operates ground-based astronomical observatories, providing the research community with access to facilities in Canada and offshore. In support of these activities, NRC manages astronomical data through the Canadian Astronomy Data Centre. Construction of the Atacama Large Millimetre/sub-millimetre Array, already operating as the most powerful millimetre radio telescope ever, will be completed in 2013-14. NRC will also continue to create instrumentation for Canada's observatories, and seek to engage Canadian industry in next generation observatories.

As part of NRC's stewardship of Canada's S&T Infrastructure, NRC's Canadian Neutron Beam Centre is accessed by Canadian and international researchers from universities, government laboratories and industry. Knowledge generated by neutron beam measurements on materials translates into advancement of science and development of materials for industrial sectors such as health, energy, aerospace, environment, transportation and communication. In 2013-14, NRC will work closely with Natural Resources Canada to align its activities in view of the current restructuring of Atomic Energy of Canada Limited.

Canada's national laboratory for particle and nuclear physics, TRIUMF, is owned and operated by a consortium of 11 Canadian universities. The core operating budget is supported via a Contribution Agreement through NRC, with additional support from tri-council funding agencies, the Canada Foundation for Innovation and the Government of British Columbia. To support the Canadian and international particle and nuclear physics community in alignment with the subatomic-physics Long Range Plan, TRIUMF will:

- support extracting and analyzing the physics from the T2K experiment in Japan, the ATLAS and ALPHA experiments at the European Laboratory for Particle Physics (CERN) and the PiENu experiment at TRIUMF;
- support the development of Canadian leadership in nuclear medicine and molecular imaging through the production and delivery of medical isotopes for the Pacific Parkinson's Program and the British Columbia Cancer Agency, and outfit and utilize the MHESA nuclear-medicine laboratory with Nordion for collaborative R&D; and
- complete the civil construction of the Advanced Rare IsotopE Laboratory (ARIEL) in 2013. ARIEL will house a superconducting electron linear accelerator (e-linac) to produce isotopes. When completed in 2014, the e-linac together with the main

cyclotron at TRIUMF will offer Canada global leadership in the production and study of isotopes for physics and medicine.

Program 2.2: Scientific, Technical and Medical Information

Program Description: *As mandated by the National Research Council Act, this program operates and maintains the national science library, specifically holding the national collection of Scientific, Technical and Medical (STM) information, and offers information services. The program provides Canada's research and innovation communities with access to global STM information to facilitate knowledge discovery, cross discipline research, innovation and commercialization.*

Financial Resources ($ millions)

Total Budgetary Expenditures (Main Estimates) 2013-14	Planned Spending 2013-14	Planned Spending 2014-15	Planned Spending 2015-16
14.7	14.7	14.7	14.7

Human Resources (FTEs)

2013-14	2014-15	2015-16
108	108	108

Program Expected Result	Performance Indicator	Target
High value information that advances research and innovation in the areas of science, technology and health/medicine	Percentage of clients who reported that NRC Canada Institute for Scientific and Technical Information (NRC-CISTI) information services contributed to advancing their research and development, technology commercialization or planning and decision-making.	85% by March 2014

This program addresses the Canadian innovation community's need for high-quality scientific, technical, medical (STM) and business-related information and data to support evidence-based decision-making and research through several activities. Under this program, NRC provides access to the published STM information held in the national science library collection. NRC also facilitates the efficient dissemination of research results through the operations of the NRC Publications Archive, DataCite Canada and PubMed Central Canada. Not-for-profit data centres can now register research data with DataCite Canada, thus allowing data producers to manage and share these data more efficiently, while PubMed Central Canada provides a channel for disseminating health-related research results. As part of this program, NRC continues to provide library services to other government departments as a means of improving efficiency in the provision of these services across the Government of Canada.

Planning Highlights

In 2013-14, NRC will work with Canadian data centres to encourage the registration of data with DataCite Canada. Five data centres currently use the service, and NRC will seek agreements with an additional 10 by 2015.

NRC will promote shared library services to additional government departments, and will offer bundled service packages to increase efficiency of service delivery. It will also introduce additional services such as a digital repository for department collections and reference services. NRC will increase the number of new agreements with other Government departments by 12 over the next three years, and will actively participate in other Government of Canada initiatives for the provision of library services.

Internal Services

The following program supports all strategic outcomes within this organization.

Financial Resources ($ millions)

Total Budgetary Expenditures (Main Estimates) 2013-14	Planned Spending 2013-14	Planned Spending 2014-15	Planned Spending 2015-16
162.0	162.0	171.0	178.9

Human Resources (FTEs)

2013-14	2014-15	2015-16
827	827	827

Planning Highlights

Governance and Management Support

Program and Project Management: In 2013-14, NRC will effectively manage its programs and projects by using processes, tools and reporting systems developed under its SAP business system to enable efficient planning, and to track performance indicators such as milestone and deliverable completion, resource utilization and revenue generation. Training will be delivered to build competency in program and project management. Preparations will be completed to launch three-year performance reviews, focused on a rigorous assessment of program progress against plans, to support renewal or closure decisions.

Integrated Communications, Marketing and Branding: Communications activities will continue to focus on engaging employees, managing relationships with clients and other stakeholders and fostering a strong reputation for NRC – nationally and internationally. The organization will be positioned in its communications outreach materials and products as a preferred solution provider to clients in key industry sectors, and as a driver of national economic growth and prosperity. NRC will also enhance its digital media presence with further refinements to its corporate web presence and through social media platforms.

Integrated Business and Client Services: NRC recently restructured its Business Management Support function, providing a centralized, flexible approach which will allow the organization to prioritize and channel resources and grow its diverse business in a strategic and proactive way. The new model includes new client-focused positions, additional business intelligence capabilities and focused positions in contract, IP and client management. In 2013-14, NRC will establish additional client management best practices and streamlined processes to identify, analyze and target specific markets and clients, aligned with its overall strategic objectives. Client Relationship Leaders, recruited in 2012-13, will receive ongoing training required to enable them to better understand and

anticipate client needs and to ensure the organization is responding to key areas of industry and market demand. Streamlined internal processes around proposals, contract management and agreement approvals will be established. The range of options and uses of intellectual property and related strategies will be clearly identified and practiced. Client satisfaction will be consistently assessed and feedback will be acted upon. Finally, NRC's Client Relationship Management system will be utilized across the organization, generating accurate reports to guide decision-making.

International Relations: In 2013-14, NRC will enhance its efforts to open key international markets for Canadian firms by stimulating and participating in technology partnering. Key international alliances such as EUREKA and the Canadian Networking Aeronautics Programme for Europe (CANNAPE) and high-level engagement with countries such as China and Israel will help Canadian companies, especially SMEs, exploit global value chains. Economic impacts and benefits resulting from EUREKA partnerships will be established and tracked over time.

Integrated Planning and Performance Measurement: NRC will complete the implementation of a corporate-level performance measurement framework, driving organizational alignment to achieve NRC's corporate-level goals and strategic outcomes, while also supporting organizational effectiveness and efficiency through quarterly review of targets against key operational performance indicators, risks and corporate planning commitments. Alignment of indicators at all levels will enable NRC to roll up achievements to demonstrate progress in meeting strategic goals and outcomes in relation to resources.

Resource Management Services

Human Resource Management Services: In 2013-14, NRC will continue building an effective framework for hiring top talent to support its new operating environment. To ensure effective leadership, continued focus will be placed on building NRC management capacity through reinforcement of management fundamentals combined with training in new targeted areas such as client relations. NRC will also develop a corporate succession management framework (to ensure strong leadership capacity and capability to execute current and future strategies), targeted initiatives with respect to NRC's performance management program "Commitment to Excellence" (to support enhanced alignment of personal and organizational performance) and a strategic human resources (HR) performance measurement approach to monitor HR risks and performance targets and enable effective decision-making. NRC will additionally refine its approach to evaluate, monitor and build employee engagement throughout the period of refocusing.

Financial Management Services: To support long-term organizational sustainability, NRC will implement specific measures in 2013-14 to support programs financially as they align to be more industry-focused and market-driven. To support NRC decision-making, refinements will be made to its new financial business model and reporting framework, which supports both an increase in revenues and a more private sector approach to planning, budgeting and reporting. NRC will also focus on optimizing its integrated financial service delivery model, reporting tools and training, which are key to supporting the success of NRC's strategic direction.

Information Management Services: NRC will continue to develop its expertise and capacity in intelligence and decision support services in order to identify the best opportunities for working with Canadian industry. Environmental scanning and competitive and market intelligence functions will be enhanced so that management has the best available information on which to base business decisions. Besides responding to the current environment, NRC will identify future national and industry needs through foresight studies, performing at least two to three studies annually by 2014-15 to support planning for emerging opportunities. Over the next three years, NRC will implement an electronic records and corporate information management system and develop related processes to ensure that all corporate information of business value is collected, stored and made accessible to support future business decisions and meet Government of Canada directives. NRC will also extend the reach and functionality of its collaboration platform, so that most NRC programs will have an online space to exchange ideas and working documents in an open and immediate manner.

Information Technology Services: Following the consolidation of IT staff in 2012, IT service improvements for 2013-14 will focus on the effectiveness and efficiency of IT services and access to them by NRC staff. To meet these objectives, NRC will ensure continuity of IT services during transition to Shared Services Canada, introduce new services to support NRC business and research activities and realize internal IT efficiencies. NRC will also undertake IT common services transformation projects, to achieve efficiencies by standardizing and reducing the complexity of the technical environment.

Security Services: In 2013-14, NRC will implement the Departmental Security Plan (DSP), which was approved by NRC's senior executive committee in June 2012. The DSP is a comprehensive, enterprise approach to security, which ensures appropriate safeguards are in place to protect staff, resources, assets and services in a cost-effective way. It will be implemented through a series of projects which include threat-risk assessments for all NRC facilities, a review of NRC security policies, the development of an NRC business continuity plan and improvements to NRC's personnel security screening processes and security awareness program.

Occupational Safety and Health: NRC will continue to build common systems and approaches within the consolidated Occupational Safety and Health (OSH) structure. To ensure compliance with legislative requirements and adherence to OSH best practices, NRC will continue to conduct safety audits in various areas of the organization, and develop and implement a suite of new directives and work procedures. To continue to enhance a culture of safety and health, NRC will focus on the recruitment and engagement of OSH volunteers and will integrate safety and health considerations as part of program and project planning.

Asset Management Services

Real Property and Materiel Services: In 2013-14, NRC will implement a single service call centre/request design for the National Capital Region (NCR) and will expand its SAP Plant Maintenance to all the regions in which NRC operates. Additionally, NRC will finalize its procurement model to align itself with NRC's programs. This process began in April 2012, with regions now reporting to Ottawa and job descriptions being finalized to reflect the

new model and corresponding reporting relationships. In the NCR, the Procurement unit has been set up by commodity groups to take advantage of bulk buying that will benefit all of NRC. These initiatives will enable NRC to support client requests across NRC in a more effective and efficient manner.

Investment Planning: NRC will manage its Investment Planning in accordance with approved Treasury Board policies. Investment plan decision-making will be integrated with the NRC program-based management model to ensure business cases for investment projects are supported by NRC's programs. NRC will also review and streamline its investment planning administrative and related management processes in order to improve efficiencies, as well as develop and submit its five-year Investment Plan (2014-15 to 2018-19) for approval by the Treasury Board.

Section III: Supplementary Information

Financial Highlights

The future-oriented financial highlights presented within this RPP are intended to serve as a general overview of NRC's financial position and operations. They are prepared on an accrual basis to strengthen accountability and improve transparency and financial management. More detailed future-oriented financial statements can be found on [20] NRC's web site.

Future-Oriented Condensed Statement of Operations and Departmental Net Financial Position

For the Year (ended March 31)

($ thousands)	$ Change	Forecast 2013-14	Estimated Results 2012-13
Total Expenses	6,786	978,284	971,498
Total Revenues	33,555	189,410	155,855
Net cost of operations before government funding and transfers	(26,769)	788,874	815,643
Departmental net financial position	**(21,829)**	**504,002**	**525,831**

Future-Oriented Condensed Statement of Financial Position

For the Year (ended March 31)

($ thousands)	$ Change	Forecast 2013-14	Estimated Results 2012-13
Total net liabilities	(3,733)	274,565	278,298
Total net financial assets	7,563	257,416	249,853
Departmental net debt	(11,296)	17,149	28,445
Total non-financial assets	(33,125)	521,151	554,276
Departmental net financial position	**(21,829)**	**504,002**	**525,831**

Future-Oriented Financial Statements

NRC's future-oriented financial statements can be found on the [21] National Research Council's web site.

List of Supplementary Information Tables

All electronic supplementary information tables listed in the 2013-14 Report on Plans and Priorities can be found on the [22] National Research Council's web site:

- Details on Transfer Payment Programs (TPP)
- Greening Government Operations
- Horizontal Initiatives
- Sources of Respendable and Non-Respendable Revenue
- Summary of Capital Spending by Program
- Upcoming Internal Audits and Evaluations over the next three fiscal years

Tax Expenditures and Evaluations Report

The tax system can be used to achieve public policy objectives through the application of special measures such as low tax rates, exemptions, deductions, deferrals and credits. The Department of Finance publishes cost estimates and projections for these measures annually in the [23] *Tax Expenditures and Evaluations* publication. The tax measures presented in the *Tax Expenditures and Evaluations* publication are the sole responsibility of the Minister of Finance.

Section IV: Other Items of Interest

Organizational Contact Information

Questions and requests for information may be directed to:

National Research Council of Canada
NRC Communications
1200 Montreal Road, Bldg. M-58
Ottawa, Ontario, Canada K1A 0R6
Phone: (613) 993-9101 or toll-free 1-877-NRC-CNRC (1-877-672-2672)
Fax: (613) 952-9907
TTY number: (613) 949-3042
E-mail: info@nrc-cnrc.gc.ca

Endnotes

[1] Department of Justice, http://laws-lois.justice.gc.ca/eng/acts/N-15/index.html
[2] Treasury Board Secretariat, http://www.tbs-sct.gc.ca/ppg-cpr/frame-cadre-eng.aspx
[3] Industry Canada, http://www.ic.gc.ca/eic/site/icgc.nsf/eng/h_00231.html
[4] The Global Competitiveness Report 2012-2013, http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2012-13.pdf
[5] Global Innovation Index, http://www.globalinnovationindex.org/gii/main/fullreport/index.html
[6] Treasury Board Secretariat, http://www.tbs-sct.gc.ca/ppg-cpr/descript-eng.aspx
[7] Treasury Board Secretariat, http://www.tbs-sct.gc.ca/ppg-cpr/descript-eng.aspx
[8] Treasury Board Secretariat, http://www.tbs-sct.gc.ca/ems-sgd/esp-pbc/me-bpd-eng.asp
[9] Industry Canada, http://www.ic.gc.ca/cis-sic/cis-sic.nsf/IDE/cis-sic3364vlae.html
[10] Industry Canada, http://www.ic.gc.ca/cis-sic/cis-sic.nsf/IDE/cis-sic336defe.html
[11] Scotiabank Global Auto Report, November 8, 2012, http://www.gbm.scotiabank.com/English/bns_econ/bns_auto.pdf
[12] Industry Canada, http://www.ic.gc.ca/cis-sic/cis-sic.nsf/IDE/cis-sic23vlae.html
[13] Industry Canada, http://www.ic.gc.ca/eic/site/ict-tic.nsf/eng/h_it05385.html
[14] Organisation for Economic Co-operation and Development, http://www.oecd-ilibrary.org/sites/sti_scoreboard-2011-en/02/08/index.html?contentType=/ns/Chapter,/ns/StatisticalPublication&itemId=/content/chapter/sti_scoreboard-2011-19-en
[15] Industry Canada, http://www.ic.gc.ca/eic/site/ict-tic.nsf/eng/h_it05864.html
[16] Industry Canada, http://www.ic.gc.ca/eic/site/aimb-dgami.nsf/eng/03492.html
[17] BCC Research, http://www.bccresearch.com/report/nanotechnology-market-applications-products-nan031e.html
[18] Industry Canada, Key Small Business Statistics, July 2012, http://www.ic.gc.ca/eic/site/061.nsf/eng/h_02711.html
[19] United States National Aeronautics and Space Administration, http://www.hq.nasa.gov/office/codeq/trl/trl.pdf
[20] National Research Council, http://www.nrc-cnrc.gc.ca/eng/reports/2013_2014/rpp_index.html
[21] National Research Council, http://www.nrc-cnrc.gc.ca/eng/reports/2013_2014/rpp_2014/rpp_supplementary.html
[22] National Research Council, http://www.nrc-cnrc.gc.ca/eng/reports/2013_2014/rpp_index.html
[23] Department of Finance Canada, http://www.fin.gc.ca/purl/taxexp-eng.asp